



ETV Verification Statement

Technology Type	Carbon filter for adsorption of hydrocarbons	
Application	Removal of hydrocarbons from polluted air	
Technology Name	DANMIL A/S DAVOC CAP	
Company	Danmil A/S	
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Verification and tests of the DANMIL A/S DAVOC CAP, was conducted and performed by the DANETV Verification Centre FORCE Technology.

DANETV was established by four independent Danish research and technology organizations and supported by the Danish Agency for Science, Technology and Innovation under the Danish Ministry of Science, Technology and Innovation, to provide environmental technology verification for vendors of air emission and energy efficient technologies. Information and DANETV documents are available at www.etv-danmark.com.

The verification centre evaluates the performance of the DANMIL A/S DAVOC CAP used primarily to remove hydrocarbons in polluted air or gas stream. This verification statement summarizes the test results for the DANMIL A/S DAVOC CAP.

Verification and test description

All tests were performed in accordance with the Verification Center Verification Protocol, June 2009. The protocol introduces the technology to be verified. Based on the application and performance parameters identification the requirements for the test design has been set. The test design includes measurement methods and scope

In order to determine the carbon filters capability to remove hydrocarbons from polluted air, the time was measured until breakthrough.

Verified technology description

The technology to be verified is applying adsorption technology for removal of hydrocarbons in polluted air or gas stream e.g. CO₂ gas used for biological processes.

The set-up for the verification test consists of the DANMIL A/S DAVOC CAP which is a small carbon filter. The carbon filter consists of a polypropylene cylinder with easy-lock couplings in both ends for easy connection. Inside the cylinder is an activated carbon felt placed on a supporting mesh. A high efficient HEPA filter is placed at the outlet of the filter.

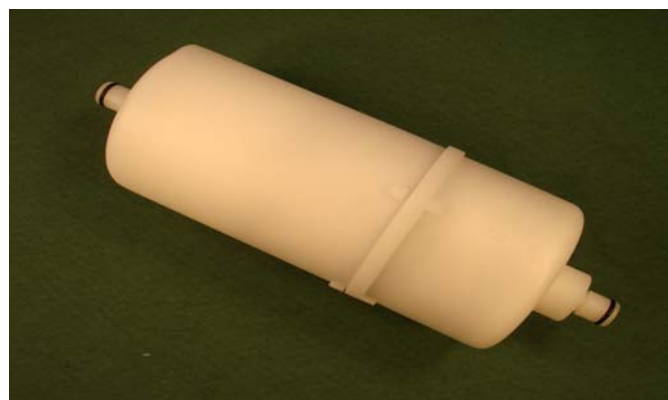
The filter is flow directional and marked with an arrow on the outside surface of the filter.

Generally the adsorption capability on activated carbon filters is depending on the following parameters:

- Type of carbon
- Type of organic compound or mixture of compounds to be adsorbed
- Air velocity through the activated carbon
- Filter design
- Temperature
- Humidity

The total adsorption capacity of the carbon implies the amount of adsorbed organic compound before the carbon is saturated.

Figure 1. Picture of a DAVOC CAP



Verification of performance

Verification and tests of the DANMIL A/S DAVOC CAP was performed from the 29th of July to the 31st of August 2009 at FORCE Technology, Park Allé 345, DK-2605, Brøndby, Denmark.

The test design is described in the following, and the test results are summarized in Table 1.

Test design

The principle for the test is: A constant flow of dried air polluted with a fixed concentration of toluene is led through the DAVOC CAP. The concentration of toluene is measured and logged continuously before and after the DAVOC CAP. Breakthrough is determined by an increase from below the detection limit to a measurable and increasing concentration of toluene after the filter. The test is repeated with three different concentrations of toluene.

Test results

The overall results of the test, concerning the durability of the carbon filter is shown in table 1.

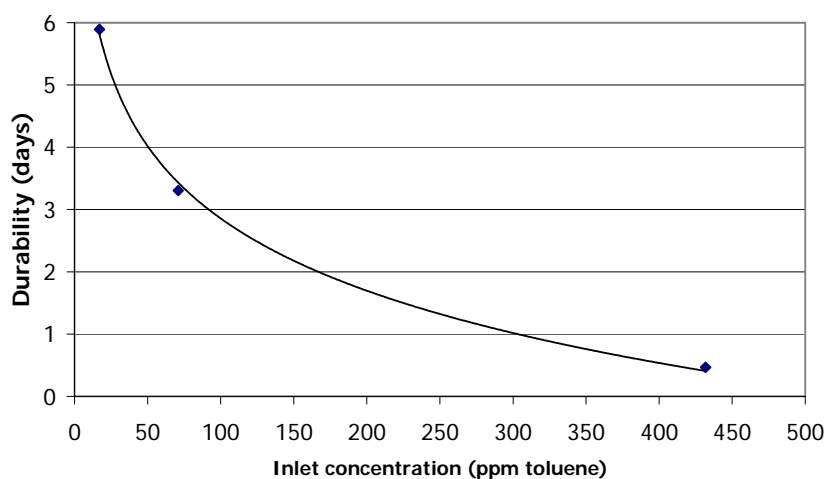
Table 1 Test results

Test date (start)	Volume flow	Concentration (inlet) ¹	Durability	
	l/min	ppm	minutes	days
29-07-2009	3,3	432	670	0,5
31-07-2009	3,3	71	4.755	3,3
31-08-2009	3,3	17	8.485	5,9

¹ Average values

The durability as a function of inlet concentration is shown in figure 2.

Figure 2 Durability in days versus average inlet concentration



The Environmental Technology Verification Program

The curve shows that the durability increases with lower concentration.

The Air Emission and Energy Efficient Technology Verification Centre quality assurance officer has reviewed the test results and the quality control data and has concluded that the data quality objectives given in the verification protocol and test/QA plan have been attained.

This verification statement addresses the following qualities of the carbon filter for adsorption of hydrocarbons: The ability to remove hydrocarbons from polluted air reported as the durability (until breakthrough) measured in time.

In accordance with the verification protocol, this verification statement is applicable to the Danmil A/S DAVOC CAP manufactured between the signature date of the verification and 3 years hereafter.

Signed by	29/6 -10	Signed by	29/6 –10
Annemette Geertinger	Date	Marianne Kyed Ørbæk	Date
Deputy Manager		Project Manager	
DANETV Steering Committee member		DANETV Verification Centre Project Manager	
FORCE Technology - Air Emission and Energy Efficient Technology Verification Centre			

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